STUDY PROJECT

THE DEPOT SYSTEM IN THE 21ST CENTURY

BY

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The depot system faces enormous challenges in the years ahead. Workload will not support the large depot system that we have today. In an era of budget reductions and force structure cuts, the depot system needs restructuring. Many of our depots are over 40 years old and urgently need modernization to be both responsive and cost effective. In addition, many depots have severe environmental problems. Since extensive modernization is both resource intensive and time-consuming, it is imperative that future equipment trends and the newest manufacturing technologies be examined to better direct the (continued on back)

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modernization effort. This study project examines both of these factors as well as mission and workload data and projections in an attempt to determine depot system needs. An organization at the Depot System Command (DESCOM) called READY 2000 has been formed to perform a highly structured analysis of many of these issues and has been extremely helpful in the development of this study project. This project does not consider the political ramifications of any recommendations nor does it make any analysis in the area of special weapons. It does, however, provide a framework for a more detailed analysis. The project discusses the readiness and sustainment impacts of increased contractor logistics support and makes specific recommendations on depot closures, realignments, and modernization effort.

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THE DEPOT SYSTEM IN THE 21ST CENTURY

AN INDIVIDUAL STUDY PROJECT

by

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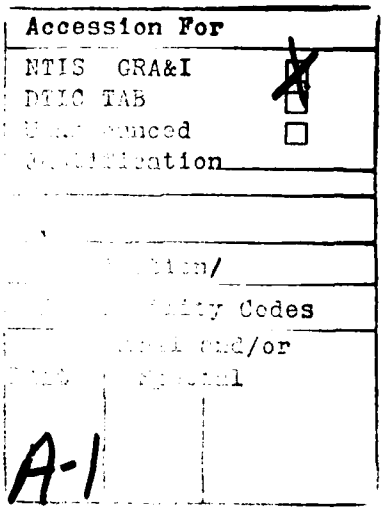

PREFACE

This study project would not have been possible without the assistance of DESCOM personnel. Specifically, the author would like to acknowledge the assistance of Colonel William D. Bristow Jr., Assistant Deputy for Command Operations, DESCOM. His efforts were invaluable in completing this project. Also, the Office of the Director of Modernization and the Deputy Chief of Staff for Engineering and Support Services at DESCOM provided information and guidance. Their cooperation was instrumental in completing this project.

It should be noted that this project was not a detailed analysis of the Army's depot needs. The question of what depot mix is needed and affordable is being calculated and refined frequently in this era of constrained budgets and mandated force reduction. The eventual solution may be better than the solution arrived at in this study, especially since the study did not consider the political ramifications of depot closure or realignment. One thing is certain, however, the depot system needs reduction, realignment and modernization to efficiently and effectively accomplish it's mission in the 21st century.

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CHAPTER I

INTRODUCTION

Last year was one of monumental change throughout the world. The fall of communism in Eastern Europe came swiftly, something that few would have had the courage to predict. Now as we just start the last decade of the century, it appears that the Soviet Union is changing significantly, as well. Communism, as an economic system, has not worked. Those nations using that economic system are now fundamentally flawed. It will probably take decades to rebuild their economies so that they will be capable of providing the goods and services demanded by the private sector. With these significant problems facing them, their attention is

focused on internal problems, rather than the overt use of military power to secure national objectives. Although the military capability is still there, the threat appears to have diminished considerably. Some could conceivably argue there is no threat.

Our nation is indeed fortunate that our strategy of containment has worked. Readiness has played a key role in deterrence and our resolve has been partly responsible for the quick demise of our adversaries. The intense pressure to reduce the national deficit had already signaled reductions in military spending, regardless of what happened in Eastern Europe and the Soviet Union. This fiscal pressure and the diminished threat have been the factors causing a significant reduction in defense spending and elimination of force structure from each of the services. Although the exact size and phasing of these reductions has not yet been decided, their size will cause military planners to propose significantly different strategies to accomplish national objectives. The Army will probably rely more heavily on contingency forces, rather than forward deployment. The mix of forces required will probably be more balanced between heavy, light and special operating forces.

As active Army units are removed from the force structure, forces that provide sustainment will be reduced also. Even before the historic events of last fall, a major initiative was begun, the Defense Management Review, to restructure DOD support activities

to make them more efficient, effective and affordable. Now it is more imperative that streamlining efforts be implemented. The Army Materiel Command (AMC) provides some of our sustainment and most of our readiness. Within AMC, the Depot System Command (DESCOM) is a vital player in providing sustainment to the force. Many DESCOM activities were built during World War II and are now old and inefficient. They simply are not capable of providing cost effective support to the force without a significant effort to modernize.

DESCOM accepted this challenge and began an effort called Ready 2000 to conceptualize what was needed for sustainment in the year 2000 and beyond. The results of this effort would be, essentially, DESCOM's long range modernization plan.

This paper will examine the present shortfalls within the depot system as well as some of the environmental problems that must be considered in any analysis of this type. It will then analyze Army planning documents to predict what type of weapons systems will require sustainment support in the future and what new technologies and manufacturing methods will be efficient and cost effective. Then an analysis will be developed to identify technology shortfalls and examine how much redundancy is needed to provide adequate sustainment. Then trade-offs will be developed to provide the best sustainment mix. This effort will provide some specific conclusions and recommendations to streamline and

revitalize the depot system for the next century.

This study will not consider the political effects of revising the depot structure. The study will not address special weapons sustainment as the author is not qualified in this area and discussion of this material might require the paper to be classified. Lastly, an analysis of this type is difficult, at best, but is extremely difficult during times of rapid change such as we are now experiencing.

CHAPTER II

DESCOM TODAY

MISSION AND ORGANIZATION

DESCOM's mission is to support AMC in providing repair parts and ammunition to the force and providing depot level maintenance and modifications to weapons systems and components as directed. DESCOM also provides a limited manufacturing capability for special purpose items.[1] The supply mission is principally performed by three Area Oriented Depots (AOD), New Cumberland Army Depot, Sharpe Army Depot and Red River Army Depot. The other depots have a supply mission in support of their maintenance programs but they do not interface with the retail supply system. Several depots specialize in repair of specific commodities. For example, Anniston Army Depot specializes in repair of tank systems and components while Tobyhanna Army Depot specializes in communications and electronics maintenance; however, their work is not limited to those areas exclusively. Furthermore, there is built in redundancy, as both Tobyhanna Army Depot and Sacremento Army Depot work extensively on communications and electronics materiel. Similar situations exist for tactical vehicle maintenance and other categories of materiel. To further complicate matters, many depots have ammunition supply and/or maintenance missions as well. Depots are located overseas as well as in CONUS. Mainz Army Depot in West Germany and the depot in Korea provide support to Europe and the Far East, respectively. Many depots have activities that report

to them rather than directly to DESCOM. The European Redistribution Facilities report to New Cumberland Army Depot since they are an extension of the wholesale supply system. It is also common to have depot personnel from a CONUS depot overseas as part of a materiel fielding team or a materiel modification effort. A map of depots and depot activities is presented at figure 1.[2] In summary, the depot system is both complex and diversified. The depot system is probably overly complex because of incremental workload decisions. It may have more diversity than we can afford at a time when resources are scarce.

DEMOGRAPHICS

DESCOM employs over 35,000 people in all parts of the country and overseas. In many locations, DESCOM is the principal employer in the area and it has a significant impact on the local economy. Changes in the DESCOM mission, especially those reducing workload or eliminating depots quickly become political issues. Examples of this are the base closures resulting from the Grace Commission and political action which has prevented closure of Lexington-Bluegrass Army Depot. DESCOM facilities are more than 40 years old and require extensive modernization to become efficient.[3] Although equipment has been modernized at some locations, the average age of industrial equipment within DESCOM is 25 years old.[4] The workforce is generally highly motivated and dedicated to producing a high quality product. DESCOM has had an

outstanding quality circle program for years and is implementing Total Quality Management (TQM), wherever applicable;however, training the workforce on new techniques and technology represents a significant challenge.

FUNDING

DESCOM operates, in part, under the Army Industrial Fund. The concept of this fund is to have the depots operate as profit centers with the value of their goods and services covering their costs and their profits generating income for modernization. In theory, once the fund was established it would not require replenishment. Properly estimated work and efficient production at realistic rates would insure enough revenue to cover material, direct labor, indirect labor, overhead and enough profit to permit reinvestment. Unfortunately, this has not occurred and the fund has required replenishment. There are several reasons for this situation. The depots are not sufficiently workloaded to perform at economical production rates. Their equipment and facilities are not modern enough to support efficient production, in many cases. Workload is erratic, thus preventing planning and production of stable programs. As the budget became more constrained, the Army leadership made a conscious decision to delay known depot maintenance requirements and use scarce funds to improve readiness. This decision had the effect of causing the depots to amortize fixed costs over a much smaller base, thus significantly increasing rates and making them less competitive with industry. This method

of funding begs the question of how healthy and necessary this competition really is. As depot rates increase, contractor logistics support becomes a more viable alternative. In some cases, contractor rebuild can now be significantly cheaper than similar work at the depot. Unfortunately, this approach has serious sustainment and surge capability implications.

PERFORMANCE

In general, DESCOM's performance has been good. Supply performance has improved with the introduction of the AOD's and will improve further as more stocks are moved to their location and on-going automation efforts are completed.[5] Army leadership has made a conscious decision to accept performance slightly below established goals but this has not caused a measurable reduction in reported readiness. Maintenance performance has not been quite as good. Although quality is generally high, complaints concerning lack of responsiveness and high rates continue to arise. Clearly, depot modernization is needed.

ENVIRONMENTAL CONSIDERATIONS

DESCOM has an enormous environmental challenge. It must ensure that the manufacturing processes used today don't generate environmental hazards and must properly dispose of any hazardous waste resulting from operations. This is a difficult task, in itself, when methods, facilities and equipment are sorely outdated and were not designed to any environmental standards. All depot

commanders are extremely concerned and sensitive to these environmental issues since they may be held personally liable in civil or criminal court for inappropriate action on inaction. Perhaps a more important issue is environmental problems caused by poor environmental practices that occurred many years ago when few knew and cared about the problem. Recognized, but not necessarily funded, environmental program requirements through FY97 are $913 million.[6] The true size of this problem is not known but it certain to be more than $1 billion. This problem has intense public interest and has significantly increased the demand for environmental lawyers and engineers. Unquestionably, environmental issues should be carefully considered when modernizing or streamlining the depot system.

READY 2000

DESCOM has recognized the need for modernization and has formed an organization to study and plan depot system requirements to efficiently and effectively sustain the force for the year 2000 and beyond. The effort is called READY 2000, which stands for REvitalization of Army Depots for the Year 2000. A staff at DESCOM is assigned full time to manage this effort and all depots actively participate. The program has four phases:strategic assessment, analysis, design and implementation.[7] It established a "corporate board" in June, 1988, to develop a corporate vision, a strategy and act as a decision support body for the Commanding General. The corporate vision is: "To be the world class organization

responsible for the command and control of the U.S. Army Materiel Command organic industrial base, with decision authority for organic/contract sourcing."[8]

This effort is a long range assessment and strategy formulation process to avoid incremental depot modernization which would be obsolete and inefficient, once implemented. In essence, it's a whole new, detailed analysis of the depot system. It is orchestrated by the DESCOM Executive Director for Modernization and captures the concepts developed by consultants and industry experts as well as the corporate leadership.

ENDNOTES

1. U.S. Army Depot System Command, Office of the Executive Director for Modernization, Master Plan, Revitalization of the Army Depots for the Year 2000,p.1.

2. U.S. Army Depot System Command, Protocol Office, Command Briefing, p.4.

3. Battelle Memorial Institute, Pacific Northwest Laboratory, Strategic Assessment for the Depot System Command, Revitalization of Army Depots for the Year 2000, p.1.

4. Ibid.

5. Ibid., p.8.

6. U.S. Army Depot System Command, DESCOM Environmental Program Briefing, p.15.

7. U.S. Army Depot System Command, Revitalization of the Army Depots for the Year 2000 Briefing, p.2.

8. U.S. Army Depot System Command, Office of the Executive Director for Modernization, Master Plan, Revitalization of the Army Depots for the Year 2000, p.17.

CHAPTER III

INTRODUCTION

In order to plan what the depot system will do in the next century one must determine the types and mix of weapons systems that will be used and their maintenance needs. This chapter will examine planning documents to gain insight into this fundamental issue. This chapter will also discuss some maintenance realities that have evolved from the newer equipment we have today and the equipment we are likely to have in the future. Finally, manufacturing technology will be examined to determine the types of equipment and facilities that will be needed to support modernized depots. It is important to capture the latest sound technologies so that scarce resources are not needed a second time to facilitate an efficient and effective depot system.

FUTURE WEAPONS SYSTEMS

The Training and Doctrine Command(TRADOC) has developed a long range plan that addresses, among other things, the types of weapons systems needed for the next century. These systems are: improved armor capability, more effective anti-armor systems, improved target acquisition and fire control, improved soft target kill capability, an effective anti-optics capability and effective mine detection and clearing capability. The combat developers also forecast a trend toward remotely operated vehicles and an increased reliance on sensors. In addition to needing extended range conventional ammunition to support the dynamic battlefield, fire

and forget missiles are needed efficiently service the target rich environment and reduce exposure caused be target designation. All of these systems must be supported by a vastly improved communications system which can provide effective command and control and position and location data on a modern, dynamic battlefield.[1] All of these new systems must be highly reliable and easily maintainable.

EXPLOITED TECHNOLOGIES

Certain new technologies will be required to field systems that meet these needs. Composite materials will be used in an effort to reduce weight and still retain structural integrity. The feasibility of this approach is now being tested. A prototype composite infantry fighting vehicle has been developed and is now undergoing testing. Without sacrificing ballistics protection, the hull weight was reduced by 25 percent and the hull was highly flame resistant. Additional weight and performance capabilities are predicted when the vehicle is designed from scratch with composite technology.[2] Once designers realize the potential of composite technology and cost effective manufacturing processes are developed, composites will be widely used in much of our equipment.

Microprocessor technology will become much more prevalent in weapons systems than it is today. Increased use of sensors with faster data rates and increased accuracy will be required to fully realize microprocessor advancements. Systems will have improved graphics capabilities as microprocessor speed increases and memory capacity increases. Many systems will use voice recognition and

voice synthesis to improve the man-machine interface. Systems will have fault tolerant design that will enable missions to continue although some portions of the system have failed. The system will detect performance degradation and reconfigure itself for operation automatically. This concept is now being designed into the LHX program and should become more common in the future. Systems will have significantly improved, on board diagnostics, so operator or maintenance personnel can quickly repair or replace faulty components. It is also quite possible that maintenance manuals and maintenance data will be integrated into the systems and controlled, upon demand, by the microprocessor. Rather than have separate training devices, it is likely that the training device function would be built in. It could be controlled by computer as well, providing a realistic environment and certainly enhancing operator performance. These goals are achievable within today's technology and enhanced capability is likely in the near future.

Future weapons systems will have an increased reliance on artificial intelligence and expert systems to perform functions faster and more efficiently. Many of these developments will be possible, also through microprocessor technology.

It is essential that hardware and software standards be developed and enforced for these new systems. The military computer family of hardware and the use of ADA as the standard language is, in theory, a sound approach to permit effective life cycle management for new systems. Standards might prevent the proliferation of contractor unique systems requiring their own,

unique test equipment or total reliance on contractor logistic support.

As we have already seen with some of the newer systems, there will be an increased reliance on repair by replacement of line replaceable units(LRU). These modules will probably be quite costly and will be repaired at some designated rear location. This means there will be an increasing demand for repairable exchange activity and a thrust to continue repair as far forward as possible.

An encouraging trend in many of newly fielded items is increased reliability and higher readiness rates. Using the newer technology which has inherently high reliability rates, designers have been able to make significant improvements in reliability, availability and maintainability. This trend will probably continue and will reduce support costs and maintenance requirements.

In summary, the future holds significant promise for increased capabilities, increased readiness and lower support costs if requirements are well articulated, sound design disciplines are employed, the equipment is adequately tested and it's used as it was intended. When this technology is fully integrated, depot workload should be more oriented on module or line-replaceable-units than it is today. Major end item rebuild will still be required but it should not be as extensive as it is today.

MANUFACTURING TECHNOLOGIES

As mentioned previously, the depot system facilities and

equipment are outdated and urgently require modernization. At the same time, the materiel they will be required to support will be significantly different than it is today, although some older more conventional equipment will still require support. Since it will take many years to plan, design, fund and build new facilities; it is imperative that the newest, feasible technologies be used. This section will discuss some new technologies that should be captured.

Information technology should support the flow of technical data and drawings from the source to individual stations on the shop floor. This will enable to have access to more relevant information in real time to support efficient production.[3] It will also provide more data on potential "line stoppers" and their current status. If work-arounds are required, they can be implemented before production stops.

There will be a tremendous increase in the use of artificial intelligence and expert systems to provide diagnostics and repair instructions at individual workstations.[4] The utility of this concept will be greatly enhanced if diagnostics connectors and communications protocol in designed into LRU's and modules.

Computer integrated manufacturing should enhance the repair effort by helping in the production process and ensuring that required materials, drawing data and repair parts are at the proper place at the proper time.

Computer stations should be networked together so the data is interactive and real time. This network should be implemented in the production facility, on the depot and at the National

Maintenance Point / National Inventory Control Point.

There will be an increased use of robotics to perform many functions. DESCOM already is using robots to apply chemical agent resistant coating paint (CARC) to vehicles in a camouflage pattern. Robots will be used extensively to perform many assembly operations and retrieval of repair parts to support production. Robot programming will be performed by hand held programming devices or the computer integrated manufacturing network. The same concepts will be used on numerically controlled machine tools. General purpose robots should be used, whenever possible, to reduce cost and increase flexibility. Robots will be used to do the dangerous, dirty and tedious jobs that are part of depot maintenance.

Depots should have some type of automated storage and retrieval system to efficiently support production with repair parts and materials. In commercial production facilities, 85% of production throughput time is spent in handling and storage and 55% of floor factory space is dedicated to this function.[5] Some systems of this type have already been installed within DESCOM with excellent results. Future systems will undoubtedly be even better.

Another important feature of a modern depot is the concept of a flexible manufacturing facility. The work area, tooling, robotics and other production equipment should be movable rather than fixed so the facility can be modified to meet the specific production line requirement.[6] In a way, a production line is perhaps a misnomer since the work may be more similar to a job shop because small quantities are involved. This fact makes it more

important that a flexible manufacturing facility be used.

So far the modernization discussed has been to improve the maintenance function. The supply function doesn't need such radical modification. The new distribution centers, once completed, should provide responsive support for years to come. However, increased use of improved bar code technology should be implemented. With this technology, it should be possible to maintain real time visibility of the item, regardless of where it is in the supply system. This technology is common in industry. This technology will enable us to maintain visibility of materiel in the pipeline so we can manage it's levels. This is particularly important for LRU's and modules since they represent significant costs and those costs will increase as they become more sophisticated. Improved asset visibility will be a significant step toward the "seamless logistics system" that may be achievable in the future.

PERSONNEL TRAINING

As depot modernization occurs, there will be a requirement to retrain the workforce. There will be a shift away from direct labor tasks to more indirect labor. There will be a requirement for computer competency, computer programming (to include robotics), industrial engineers and management personnel. Even those performing direct labor will require significant retraining to understand the system.[7] Much of this training can be accomplished by videotape or videodisc methods. Some training will have to be conducted at centralized locations or contractor

facilities. Some relocation of the workforce may also be required to get the correct manpower skills at the proper depot. Efforts should be initiated in the near future to minimize the cost and sacrifice caused by the need to retrain the workforce.

ENDNOTES

1. U.S. Army Training and Doctrine Command, TRADOC Long Range Plan FY 1991-2020, Volume I, pp.3-9 - 3-11.

2. Chuck Paone, "Composite Infantry Fighting Vehicle Unveiled", Army RD&A Bulletin, January-February 1990, pp. 29-30.

3. Battelle Memorial Institute, Pacific Northwest Laboratory, p.11.

4. Ibid., p.12.

5. Ibid.

6. Tooele Army Depot, Consolidated Maintenance Facility Project Statement, p.2.

7. Battelle Memorial Institute, Pacific Northwest Laboratory, p.13.

CHAPTER IV

SUPPORT CONCEPTS

CONTRACTOR LOGISTICS SUPPORT

When discussing depot support, a case could be made for having the contractor support the system rather than the depot. In fact there are an increasing number of systems that are now being at least partially supported by the contractor. This has been caused by increased depot costs and the reluctance of Program Managers to transfer support from the contractor at the appropriate time. Because of fielding schedule pressures and the time it takes to obtain depot maintenance work requirements, develop tooling and test equipment and obtain repair parts; it is common for systems to start out with contractor support. Often, support costs may be minimized with contractor support if expensive LRU's are a part of the system. The contractor can establish responsive LRU repair facilities and use effective transportation networks, thus significantly reducing pipeline costs. Finally, Program Managers

feel more secure with the contractor providing the support since he built the system.

Although it is often difficult to quantify, depot support is generally cheaper throughout the life cycle. It is very difficult to induce competition for contractor logistics support, thus costs remain unnecessarily high. Furthermore, there are significant surge and war time support questions that need to be answered, if contractor logistics support is to be used. Increased use of contractor logistics support may entail an unacceptable risk.

GOVERNMENT OWNED-CONTRACTOR OPERATED

Another possibility would be to have the contractor operate out of a government facility; in fact, this arrangement is not unusual. The M-1 Tank Facility in Detroit is owned by the government yet run by General Dynamics. There is a government owned-contractor operated facility at Lexington-Bluegrass Army Depot. This approach is generally cheaper than contractor logistic support but it requires government facilitization of plant and equipment.

DEPOT

The way to make the depot a more attractive support alternative is to become more efficient, properly workload it and charge extremely competitive prices. Then insist that support is

of the highest quality and is responsive to the needs of the Army. In addition to the depot having surge capability, there are some items that can't be manufactured by contractors. What really needs to be done is a thorough analysis of core functions to determine what work should be done by the contractor and what work should be done at our depots.

CORE FUNCTIONS

DESCOM's Ready 2000 project performed a core function analysis to determine what capabilities needed to be retained in the depot system and which functions were nice to have in the system but not required. The purpose of the analysis was to prioritize modernization efforts to the important areas. The core functions are those sustainment activities which are intrinsically organic depot work. During the analysis, several key principles became apparent:

"1) Commercial sources are preferred for manufacture and assembly of new end items, components and spare parts.

2) An organic depot maintenance capability is needed to meet mobilization needs.

3) An organic depot-level maintenance is preferred for major systems.

4) Supply is inherently an organic activity.

5) Activities will be performed organically when

necessary to meet security requirements.

6) Mobilization planning drives much of the decision making for maintenance of combat mission-essential materiel."[1]

One of the most valid arguments for a strong depot system is the surge requirements needed for the first 90 days of a large scale war. This period, prior to effective mobilization, is critical and the commercial sector will not have been fully mobilized to support the war effort. In fact, it may take a great deal longer for industry to get fully behind the war effort if history is a good indicator. The depot command and control structure and a ready source of end items, LRU's, and repair parts will play a critical role. In theory, a short war would have to be fought with materiel in theater. In that case, neither the depot nor industry would play a significant role. However, during my assignment to DESCOM I was amazed at how much depot support was provided to the field to support unscheduled operations. The depot system also has a pool of knowledge on lessons learned during fielding, modification and rebuild. They can be called upon to provide extremely responsive support to the field. Furthermore, if the depot system is to perform well in wartime, it must train for war time tasks during peacetime, just like any other unit.

DESCOM developed a listing of core functions using decision tree logic. Using similar logic they developed a list of core items using the Source of Repair decision process outlined in AR 750-2.[2] Results indicated that most combat mission essential equipment requiring overhaul or major modification should be

performed by the depot. In addition, special weapons material and conventional or chemical weapons requiring demil should be performed in house. Also, in some cases the end item or its components are obsolete and support is only feasible within the depot system. Wholesale supply support and supply support to the depot remained depot functions as well.

SUMMARY

In this chapter, some aspects of contractor logistic support, contractor support and depot support have been discussed. A core function analysis has been presented which illustrates what type of work or functions or functions should be retained by the depot system. In many cases the ability to meet surge requirements is significant in the decision making process. In the next chapter, some depot workload data will be presented in an attempt to come to some conclusions as to which depots should be modernized and which depots should be closed or placed in an inactive status.

ENDNOTES

1. U.S. Army Depot System Command, Office of the Executive Director for Modernization, Core Functions of the Army's Depot System, p.7.

2. Ibid., p.12.

CHAPTER V

WORKLOAD DATA

The purpose of this chapter is to present some workload data for the depots, show possible trends and make some predictions of the impact on workload of announced force reductions. Armament, munitions and chemical materiel workload (9%) is declining slightly unless depot support capability for new systems can be improved. Depot workload for aviation systems (27%) is increasing. Communications and electronics workload (20%) is decreasing, principally because of new non developmental systems which either have contractor support or have few support requirements. Missile workload (11%) is increasing because of the introduction of many new systems. Tank automotive workload (29%) is decreasing slightly, principally because of the introduction of newer systems with higher reliability. General materiel workload (4%) is decreasing slightly because of new purchases.[1]

The data presented above discussed workload by commodity command. However, as mentioned before, each depot performs many functions and is generally workloaded by more than one commodity command. For example, Letterkenny Army Depot receives truck workload and works on, among other things, missile items. For

these reasons, it is perhaps better to examine depot workload as a function of the core analysis, by depot. In this way, a better picture of actual workload can be developed. Such an analysis, by depot, is presented at figures 2-14.[2] Mobilization requirements are presented as well as peacetime data.

Force reductions should reduce workload still further in the out-years. Reductions will probably be most pronounced in the area of combat and tactical vehicles where older equipment will be displaced by newer materiel and different training methods may be employed. However, the recent decision not to introduce the Block II modifications to the M-1 tank and proceed with the Block III modification later will probably mean an increased workload for tank systems. Workload reductions of slightly lesser magnitude will probably occur in other materiel categories. Certainly with the workload data presented above and further known reductions, it is time to seriously consider depot reductions and modernization.

ENDNOTES

1. Battelle Memorial Institute, Pacific Northwest Laboratory, p.7.

2. U.S. Army Depot System Command, Office of the Executive Director for Modrnization, Military Worth Assessment for the Defense Management Review, pp. 2-13.

CHAPTER VI

Conclusions

Based upon technology trends, workload data, force structure cuts and budgetary pressure, some depot closures and mission realignments are justified. In some cases, these conclusions may be similar to those proposed by the Defense Management Review. The depot system can no longer afford to have depot mission redundancy for the sake of competition. In fact, the concept of competition among depots is somewhat erroneous because of problems with the industrial fund. The real competition to depots is the industrial sector and the way to counter it is to increase workload and efficiency. Workload, under these conditions, can be best increased by depot closure and realignment. Efficiency can be best increased by depot modernization.

The Army doesn't need three area oriented supply depots. New Cumberland and Sharpe Army Depots can handle the mission now and in the foreseeable future. Therefore, the wholesale supply mission at Red River Army Depot should be transferred to the other two depots. When this is accomplished, the other two depots can operate more efficiently and less inventory will be in the system.

Ammunition operations are a more complex issue. Special weapons depot operations should remain the same. This conclusion is consistent with mobilization workload data. Furthermore, this area was exempt from my study. With respect to conventional ammunition, Savanna Army Depot should remain based upon mobilization workload. Many of the traditional maintenance depots have ammunition missions as well. As a general rule, I believe that many of these depots should get out of the ammunition business. For example, Red River Army Depot has a very small ammunition mission that could be transferred to another location. Other depots are in similar situations. Based upon workload, the ammunition mission could easily be moved from Lexington Blue Grass Army Depot. The remainder of the depot should be either run as a GOCO facility or closed. The other ammunition operations probably need to be examined more closely in conjunction with similar facilities under the control of the Armaments, Munitions and Chemical Command (AMCCOM). There is considerable duplication in this area between AMCCOM and DESCOM.

The communications and electronics workload doesn't justify two depots. As recommended by the Defense Management Review, Sacramento Army Depot should be closed and its workload assumed by Tobyhanna Army Depot. Lexington-Bluegrass Army Depot isn't needed either and should be eliminated. (The present proposal is to close Lexington and keep Bluegrass open as a government-owned-contractor operated facility.)

Corpus Christi Army Depot is the only depot working on

aviation systems and its workload is growing. Therefore, no changes are proposed in this area.

Four CONUS depots remain for analysis. Anniston Army Depot specializes in tank systems but can perform in many other areas as well. Their workload requirements are stable and mobilization demands are critical. No reductions are seen to the mission. Red River Army Depot specializes in combat vehicles in addition to other materiel. They have a significant maintenance capability in most areas. They should become a center for depot maintenance of LRU's of all types. To do this efficiently, they should be one of the first depots for extensive modernization. Tooele Army Depot has already been identified for extensive modernization under a project called the Consolidated Maintenance Facility. This $37 million project has been approved and construction is scheduled for completion by 15 November 1991.[1] Equipment and systems installation should be complete in 1992.[2] This facility will have much of the manufacturing technology concepts discussed earlier.

The only remaining Conus depot to be discussed is Letterkenny Army Depot. Much of the workload could easily be performed at other installations. For example, ammunition workload could be easily be transferred as well as the general supply mission. The maintenance mobilization increase is small and the core functions are redundant within the depot system. Strong consideration should be given to closing this depot. Part of the analysis must include all the tenant activities, to include DESCOM Headquarters.

The overseas installations are somewhat of an enigma. For

example, Mainz Army Depot desperately needs work. Much of their work has been programmed for other maintenance units or has been postponed. Much of their work is more appropriately general support rather than depot. There is a tremendous capability at Mainz that will be of great benefit to a peacetime force in Europe. Whether it should remain is probably a function of what force planners do to the force structure in Europe. If they take much of the cut with support personnel, Mainz Army Depot should remain. If the support infrastructure remains strong, Mainz Army Depot should probably be closed. From a wartime perspective, Mainz Army Depot may be vulnerable to attack but has it has a tremendous capability to perform Battle Damage Assessment and Repair (BDAR) and may be the quickest source of repair parts and maintenance expertise for our complex weapons systems. DESCOM activities in Korea (D-Safe) are principally contractor activities. They should remain in place as long it is cheaper to perform the work in theater rather than in CONUS. As forces are reduced there, it provides a more convincing argument to do the work here. Recommend no change for D-Safe until more is known about force reductions.

The only remaining question is DESCOM Headquarters, itself. This is an emotional issues. I believe the Headquarters is too large but its function adds value and can't be well performed by other agencies. DESCOM should plan, program and manage the construction of modernized facilities, plan and obtain funding for the immense environmental programs that needs to take place and retain the missions they are already performing. This effort can

probably be done with less personnel, as was identified by the Defense Management Review.

In this chapter, specific recommendations have been made to change the depot system. These recommendations are preliminary and need to be carefully analyzed prior to any definitive action.

ENDNOTES

1. U.S. Army Depot System Command, Deputy Chief Of Staff for Engineering and Support Services, Status of TEAD Consolidated Maintenance Facility, February 1990, p.1.

2. Ibid.

CHAPTER VII

Recommendations

In the previous chapters the present condition of the depot system has been discussed extensively. The system urgently needs modernization. This modernization needs to be as futuristic as possible so the investment maximizes capability. The Army has trouble reinvesting for capital improvements. Too many other priorities compete for scarce resources. The technology trends in new weapons systems were discussed as well as manufacturing technologies which should be integrated into modernized facilities to optimize support.

However, modernization, itself, isn't the answer. Some facilities need to be closed to make the system competitive with industry yet still retain a surge capability within the Army. Depots proposed for closure include Sacramento Army Depot, Lexington Blue Grass Army Depot and Letterkenny Army Depot.

Some depots need to be realigned to improve the system. For example, Red River Army Depot needs to lose it's wholesale supply and ammunition missions so it can concentrate on its mission of LRU repair and extensive support for both combat and tactical vehicles.

Experience gained from planning and construction of the Consolidated Maintenance Facility at Tooele Army Depot should provide a sound learning curve for Red River Army Depot to modernize after realignment. Anniston Army Depot should be next to modernize. Tobyhanna Army Depot should be the last to modernize so it can take full advantage of technological breakthroughs in electronics assembly, testing and repair.

Ammunition operations need a detailed analysis. The study needs to consider ammunition activities under control of AMCCOM as well as DESCOM. This should be done by AMC as soon as possible. There are significant potential savings in this area. There is another area of conflict between these two commands. Activities at Rock Island Arsenal and Watervaliet Arsenal appear to compete with DESCOM activities. This area should be examined by AMC also.

There is also some redundancy in supply and maintenance activities between the other services and the DOD. For example, there are probably some similarities between maintenance operations at Corpus Christi Army Depot and Kelly Air Force Base. Similarly, there is probably some consolidation possible between New Cumberland Army Depot and Defense Depot Mechanicsburg, 30 miles away. Another example is Sharpe Army Depot and Defense Depot Tracy.

After all changes have been made, Anniston and Red River Army Depots will perform maintenance on combat vehicles (including artillery) and LRU repair. Toole Army Depot will repair tactical vehicles and their LRU's and Tobbyhanna Army Depot will repair all

communications and electronics materiel. Corpus Christi Army Depot will continue to support aviation systems. The wholesale supply missions will be performed by New Cumberland and Sharpe Army Depots.

It must be emphasized that this analysis didn't consider any political ramifications of depot closure or realignment. There is a significant impact on the local economies of all depots faced with closure or mission reduction. These areas have been a source of dedicated, hard-working employees for many years. They have been a vital part of our nation's sustainment base. In many cases, the depots have been the largest employer in the area. The impact will be significant.

DESCOM already provides responsive support to the field, yet sometimes it has been perceived as an organization that is closely associated with industry and not a part of the "real Army". This perception needs to be changed by increased presence in the field performing modifications, customer assistance and liaison. (This effort is already on-going but needs to be intensified.) Depot personnel should also take part in field exercises to learn more about the field environment and its effect on equipment. This cross-training will instill in depot personnel a sense of urgency which will increase their responsiveness to actual field requirements. These efforts should help break the perceived barrier between the wholesale and retail systems, make the depot system more responsive to field needs and make the field more sensitive to unique depot requirements.

All factors considered, this paper addresses a viable approach to modernizing and streamlining our depot system. There are perhaps many other schemes that will produce similar results. Any approach that is taken, must consider depot closure and realignment as well as a significant modernization effort. These are the keys to a depot system that will provide responsive wholesale support to our Army in peacetime and provide the base for continuous support during wartime. The sustainment base must remain to support our national military strategy.

SAVANNA ARMY DEPOT ACTIVITY

DIVERSITY OF CORE FUNCTION 1
CORE FUNCTIONS

AMMO

MOBILIZATION REQUIREMENTS FORECAST 900%
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
AMMUNITION	7,647	73,000	954%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 13%

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
CAROLL	8,593
JO DAVIESS	11,635
JACKSON	9,982
CLINTON	22,908
(TOTAL)	53,118

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
CAROLL	1,065
JO DAVIESS	1,460
JACKSON	604
CLINTON	4,030
(TOTAL)	7,159

Figure 2

Figure 3

NEW CUMBERLAND ARMY DEPOT

DIVERSITY OF CORE FUNCTION 1
CORE FUNCTIONS

SUPPLY

MOBILIZATION REQUIREMENTS FORECAST 100 %
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
GENERAL SUPPLY	381,659	2,418,927	175%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 24%

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
CUMBERLAND	99,565
DAUPHIN	125,125
YORK	170,467
(TOTAL)	395,157

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
CUMBERLAND	16,264
DAUPHIN	24,996
YORK	53,448
(TOTAL)	94,708

SACRAMENTO ARMY DEPOT

DIVERSITY OF CORE FUNCTION 7

CORE FUNCTIONS

SUPPLY	VOICE COMM
TRUCK	ELEC SUP EQUIP
COMBAT VEH	VISUAL SURVEILLANCE EQUIP
FIRE CONTROL	

MOBILIZATION REQUIREMENTS FORECAST 200%
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
MAINTENANCE	995,000	1,861,776	187%
AMMUNITION			
GENERAL SUPPLY	401,347	413,891	103%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 6%

COUNTY CIV WORKFORCE COUNTY	STRENGTH	COUNTY CIV MANUFACT WORKFORCE COUNTY	STRENGTH
SACRAMENTO	456,322	SACRAMENTO	26,650
(TOTAL)	456,322	(TOTAL)	26,650

Figure 4

ANNISTON ARMY DEPOT

DIVERSITY OF CORE FUNCTION 13

CORE FUNCTIONS

LIGHT COMBAT	SMALL ARMS	AIRCRAFT ARMT	ELEC SUP EQUIP
TANKS	SUPPLY	VEH SUP EQUIP	
MISSILES	AMMMO	TRUCK	
ARTILLERY	FIRE CONTROL	RADAR	

MOBILIZATION REQUIREMENTS FORECAST 200 + %
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
MAINTENANCE	1,636,500	3,263,426	199%
AMMUNITION	57,106	124,330	218%
GENERAL SUPPLY	242,013	192,350	79%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 14%

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
CALHOUN	51,893
CLEBURNE	5,720
TALLADGA	32,144
FTOWAH	43,953
(TOTAL)	223,467

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
CALHOUN	10,431
CLEBURNE	1,199
TALLADGA	7,873
FTOWAH	11,584
(TOTAL)	31,087

Figure 5

TOBYHANNA ARMY DEPOT

DIVERSITY OF CORE FUNCTION 11

CORE FUNCTIONS

SUPPLY	COMBAT VEH	BOATS
AVIONICS	VOICE COMMUN.	RADAR
ELEC SUP EQUIP	CONSTRUCTION	GENERATOR SET
TRUCK	MISSILE	

MOBILIZATION REQUIREMENTS FORECAST 200%+
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
MAINTENANCE	1,652,500	3,960,793	240%
GENERAL SUPPLY	226,969	487,735	214%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 20%

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
MONROE	39,517
LACKAWANNA	105,661
LUZERNE	156,898
(TOTAL)	302,076

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
MONROE	5,342
LACKAWANNA	24,923
LUZERNE	31,575
(TOTAL)	61,845

Figure 6

LEXINGTON BLUE GRASS

DIVERSITY OF CORE FUNCTION 11

CORE FUNCTIONS

SUPPLY	VOICE COMMUN	NBC EQUIP
AMMO	MISSILE	TRUCKS
AVIONICS	SMALL ARMS	TROOP SUPP EQUIP
ELEC SUP EQUIP		RADAR

MOBILIZATION REQUIREMENTS FORECAST
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
AMMUNITION	33,630	93,959	279%
GENERAL SUPPLY	40,464	150,677	372%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 16%

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
MADISON	27,898
FAYETTE	119,347
CLARK	14,760
(TOTAL)	162,005

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
MADISON	3,319
FAYETTE	18,259
CLARK	3,804
(TOTAL)	25,382

Figure 7

CORPUS CHRISTI ARMY DEPOT

DIVERSITY OF CORE FUNCTION 4

CORE FUNCTIONS

ROTORY AIRCRAFT

AVIONICS

SUPPLY

ELECTRONIC SUPPORT EQUIP

MOBILIZATION REQUIREMENTS FORECAST 200%
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
MAINTENANCE	2,032,500	4,323,949	213%
GENERAL SUPPLY	204,041	587,403	287%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 3%

COUNTY	COUNTY CIV WORKFORCE STRENGTH	COUNTY	COUNTY CIV MANUFACT WORKFORCE STRENGTH
NEUCES	122,279	NEUCES	5,200
	(TOTAL) 122,279		(TOTAL) 5,200

Figure 8

RED RIVER ARMY DEPOT

DIVERSITY OF CORE FUNCTION 14

CORE FUNCTIONS

SUPPLY	LGHT COM VEH	FIRE CONTROL	CONST. EQUIP.
AMMO	VOICE COMMUN.	AIRCRAFT ARMT	MISSILES
AVIONICA	ELECTRONIC	TRUCK	ARTILLERY
SMALL ARMS	SUPPORT EQUIP	GENERATOR SETS	

MOBILIZATION REQUIREMENTS FORECAST 200 + %
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE
MAINTENANCE	1,415,000	2,958,861	209%
AMMUNITION	21,097	77,144	366%
GENERAL SUPPLY	1,111,491	1,287,038	116%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 10

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
BOWIE	39,917
CASS	14,966
MILLER	17,960
(TOTAL)	54,883

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
BOWIE	4,935
CASS	738
MILLER	2,539
(TOTAL)	5,673

Figure 9

SHARPE ARMY DEPOT

DIVERSITY OF CORE FUNCTION 2
CORE FUNCTIONS

GENERAL SUPPLY

BOATS

MOBILIZATION REQUIREMENTS FORECAST 100% +
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
GENERAL SUPPLY	459,485	623,000	135%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 11%

COUNTY CIV WORKFORCE COUNTY	STRENGTH	COUNTY CIV MANUFACT WORKFORCE COUNTY	STRENGTH
SAN JOAQUIN	183,352	SAN JOAQUIN	20,868
(TOTAL)	183,352	(TOTAL)	20,868

Figure 10

TOOELE ARMY DEPOT

DIVERSITY OF CORE FUNCTION 8

CORE FUNCTIONS

ENG & CON EQUIP		MISSILES	
AIRCRAFT		BOATS	
GENERATOR SETS		LIGHT COMBAT VEHICLES	
TRUCKS		AMMO SUPPLY	

MOBILIZATION REQUIREMENTS FORECAST 200 + %

(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
MAINTENANCE	1,163,500	2,249,802	193%
AMMUNITION	13,889	106,119	764%
GENERAL SUPPLY	174,057	183,359	105%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 15%

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
TOOELE	11,907
JUAB	2,058
SALT LAKE	349,189
(TOTAL)	351,247

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
TOOELE	1,141
JUAB	200
SALT LAKE	51,430
(TOTAL)	52,771

Figure 11

SENECA ARMY DEPOT

DIVERSITY OF CORE FUNCTION 3
CORE FUNCTIONS

SPECIAL WEAPONS
GENERAL SUPPLY

AMMUNITION

MOBILIZATION REQUIREMENTS FORECAST 400% +
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
AMMUNITION	11,471	47,996	418%
GENERAL SUPPLY	36,175	18,750	52%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 22

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
SENECA	13,318
YATES	9,251
CAYUGA	36,187
WAYNE	41,851
(TOTAL)	100,607

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
SENECA	5,203
YATES	698
CAYAUGA	4,976
WAYNE	5,969
(TOTAL)	16,846

Figure 12

LETTERKENNY ARMY DEPOT

DIVERSITY OF CORE FUNCTION 16

CORE FUNCTIONS

SUPPLY	ART, TOW/SELF PRO	SMALL ARMS	COMMUNIC.
AVIONICS	MISSILE	BOATS	TRUCK
AMMO	ELECTRONIC	FIRE CONTROL	GEN SET
LGHT COM VEH	SUPPORT EQUIP	ENG & CON EQUIP	TROP SUP EQ.
			RADAR

MOBILIZATION REQUIREMENTS FORECAST 200 + %
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
MAINTENANCE	1,018,000	1,921,231	189%
AMMUNITION	20,183	68,194	338%
GENERAL SUPPLY	294,463	643,212	218%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 22

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
FRANKLIN	55,421
FULTON	5,862
HUNTINGDON	17,879
ADAMS	36,134
(TOTAL)	115,296

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
FRANKLIN	12,456
FULTON	999
HUNTINGDON	3,042
ADAMS	7,041
(TOTAL)	25,538

Figure 13

SIERRA ARMY DEPOT

DIVERSITY OF CORE FUNCTION 2
CORE FUNCTIONS

SPECIAL WEAPONS

GENERAL SUPPLY

MOBILIZATION REQUIREMENTS FORECAST 600% +
(3 YR AVERAGE)

	6 MONTH PEACETIME WORKLOAD	6 MONTH MOB WORKLOAD	% INCREASE/ DECREASE
AMMUNITION	14,346	98,586	687%
GENERAL SUPPLY	14,478	100,809	696%

SKILLED WORKFORCE AVAILABLE IN SURROUNDING CIV COMMUNITY % 7

COUNTY CIV WORKFORCE

COUNTY	STRENGTH
LASSEN	9,088
MODOC	4,094
PLOMUS	8,497
WASHOE (NV)	136,339
(TOTAL)	158,007

COUNTY CIV MANUFACT WORKFORCE

COUNTY	STRENGTH
LASSEN	583
MODOC	126
PLOMUS	769
WASHOE (NV)	9,351
(TOTAL)	10,829

Figure 14

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